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(12) # EUROPEAN PATENT APPLICATION

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(54) **Method and structural element for erecting a building and building thus formed.**

(57) The invention relates to a method of erecting a building in which panels are formed by pouring a filling substance in chute spaces against erected networks. According to a known method of that kind prior to casting the concrete the networks are fastened to a scaffolding frame, which is removed after the concrete has cured. Releasably securing the networks to the scaffolding frame is an operation requiring craftsmanship.

The invention has for its object to provide a simple method. For this purpose, in the method embodying the invention, the panels are formed by chute spaces which are formed by filling with a filling substance structural elements consisting of frameworks and networks carried by said frameworks.

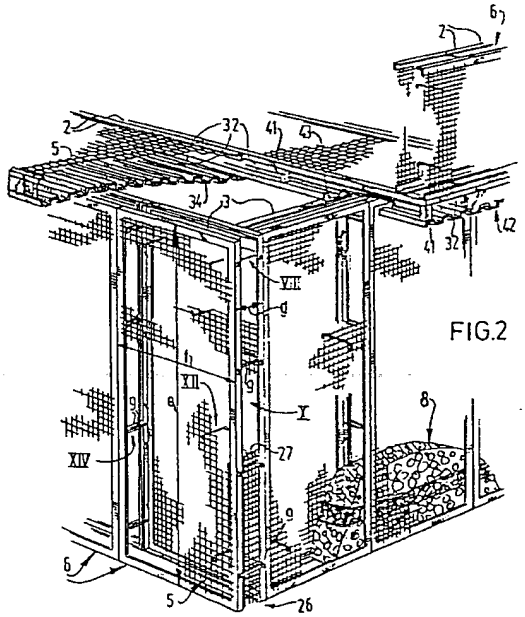

FIG.2

EP 0 055 504 A1

Short title: Method and structural element for erecting a building and building thus formed.

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The invention relates to a method of erecting a building in which panels are formed by pouring a filling substance in chute spaces against erected networks.

Such a method is known from Dutch Patent Specification 41,677. Herein prior to casting the concrete the networks are fastened to a scaffolding frame, which is removed after the concrete has cured. Releasably securing the networks to the scaffolding frame is an operation requiring craftsmanship.

The invention has for its object to provide a simple method. For this purpose, in the method embodying the invention, the panels are formed by chute spaces which are formed by filling with a filling substance structural elements consisting of frameworks and networks carried by said frameworks.

In this method the building derives its solidity in the first place from the structural elements, whilst the filling substance contributes to the deformation resistance

and to the preservation of the relative positions of said structural elements. According to the invention buildings of different shapes and dimensions can be readily established with a rectangular module.

The filling substance may be locally available rubble so that at the same time the problem of rubble removal is solved. The rubble may be a heterogenous mass and may consist of coarse or small lumps and grains.

Preferably the rubble is broken up into lumps of a size equal to the order of magnitude of the mesh of the network. In this way a firm engagement between the network and the debris lumps therein is obtained.

The building according to the invention is resistant to earthquakes and fire both after and during the building activities. The local population is capable of carrying this method into effect within a short period of time, which may help to overcome the apathy that may be felt after an earthquake.

It is preferred to use as a filling substance alternating layers of rubble and binder such as mortar in the receiving space. It is then not necessary to mix in advance the rubble and the mortar, whilst finally adequate adhesion between mortar and rubble is nevertheless obtained. The rubble-filled panels have satisfactory insulating and climatological properties, particularly because of the inertia in heating up and cooling down.

It is preferred to apply a plaster layer to the outer side of the filled space panel. Unskilled labourers can apply plaster coating to a coarse substrate of gauze holding protruding brick parts. Yet, a solid wall is built up in this way with a well-finished appearance.

When a chute space is formed between two structural elements coupled with one another by coupling elements, the filling matter will urge the structural elements away from one another over a distance admitted by the coupling elements. In this way the relative positions of the structural elements are satisfactorily fixed, whilst previous coupling of the structural elements may be quite provisional.

The coupling elements may be formed by simple metal hooks. When hooks operating as tensile members are arranged between the opposite networks of a chute space, the material of the networks may be thinner and/or the panel will have flatter side surfaces.

The invention furthermore relates to a building constructed by carrying out the method embodying the invention and to structural elements apparently intended to be employed in the method in accordance with the invention.

In the following description the invention will be explained with reference to a drawing.

The drawing shows in:

Fig. 1 a perspective elevational view of a building constructed by carrying out the method embodying the invention,

Fig. 2 on an enlarged scale detail II of Fig. 1 during the performance of the method embodying the invention,

Fig. 3 a perspective view of a structural element of Fig. 2,

Fig. 4 a perspective view of a structural element,

Fig. 5 an enlarged perspective view of detail V of Fig. 3,

Fig. 6 an enlarged sectional view taken on the line VI-VI of Fig. 3,

Fig. 7 a perspective view of a chute space for a panel,

Fig. 8 an enlarged perspective view of detail VIII of Fig. 2,

Fig. 9 a variant of Fig. 8,

Fig. 10 an enlarged side elevation of detail X of Fig. 2,

Fig. 11 detail X of Fig. 7 in a transport position,

Figs. 12 and 13 an enlarged perspective view of detail XII and XIII respectively of Fig. 2,

Fig. 14 a perspective view of a different building when the method embodying the invention is being carried out,

Fig. 15 on an enlarged scale detail XV of Fig. 14 and

Fig. 16 on an enlarged scale detail XVI in Fig. 1.

By the method embodying the invention a building 1 of Fig. 1 is erected on a simple, substantially levelled-out, fairly hard ground 7, for example, of sand or rubble are formed standing panels 6 by forming chute spaces 3 by means of structural elements 2 and by filling out said spaces 3 with a filling substance 8.

The structural elements 2 each consist of a framework 10 of four angular profiles 11 welded to one another and having a width a = 3 cms and a thickness b = 3 mms, in which a tension-resistant network 5 of metal wire having a thickness c = 3 to 4 mms and a mesh d = 5 cms is secured by welds 14. The wires 12 are spotwelded to one another at crossings 13. The structural elements 2 have a length e = 2.8 metres and a width f = 1 metre and can be readily handled manually. A chute space 3 is each time formed between two standing structural elements 2 at a relative distance g of 25 cms, intercoupled by means of coupling elements 9. The coupling elements 9 are formed simply by a pull rod 17 having hook-like ends 18 inserted into holes 16 of the angular profiles 11.

Fig. 9 shows a further coupling element 20 having Z-shaped ends 21. By means thereof a pair of structural elements 2 as shown in Fig. 11 can be transported to the site in the form of a folded-up unit.

A pair of structural elements may be intercoupled by means of link-shaped coupling elements provided, for example, with locking means fixing them in their relative working positions.

The networks 5 are coupled with one another by means of hooks 22 (Fig. 12) operating as tensile members and distributed along the surface of the networks 5. The hooks 22 may be shaped in the form of an S. The neighbouring structural elements 2 are interconnected by means of tie elements 23 consisting of a reinforcing bar 24 having two bent-over ends 25 to be embedded in the filling substance 8 and being

passed through holes 16 of angular profiles 11.

At a corner 26 a narrow strip 27 of gauze of the same type as that of the network 5 can be inserted to locally close the chute space 3. When the chute spaces 3 are ready, the filling substance 8 is poured into them preferably in alternating layers of rubble and cement mortar. If the cement mortar is thin-liquid, the cement mortar flowing across the networks 5 is collected and again poured out from above or it is retained, for example, by means of boards manually held on the network 5 or it is smeared by means of a small board to the outside of the network to form a plaster coating. As the case may be, cement mortar may be applied simultaneously or afterwards to the outer side as a plaster coating.

Preferably the building 1 comprises as many identical structural elements 2 as possible. At the windows and above the doors short structural elements 30 as shown in Fig. 4 and as thresholds beneath the doors the structural elements 29 of Fig. 16 are employed. The structural elements 29 are coupled by means of coupling elements 9 with adjacent structural elements 2 in order to complete an earthquake-resistant cage construction.

The roof 31 is made by forming a chute space 32 by means of waste casing sheets 34 of trapezoidal profile on the underside. As the case may be, structural elements 2 held at a higher level by means of blocks 41 may retain the top sides of these chute spaces 32. The gap between the casing sheets 34 of the walls of the building is sealed, for example, by means of a strip 43 of synthetic foam.

Subsequently a balustrade 45 is placed by using structural elements 2 standing on their sides.

When the span is more than 4 metres, the roof 31 is supported in the middle by girders 46, for which a console 48, for example, of the kind shown in Fig. 15, is arranged on an intermediate wall 47 and an end wall 49.

The roof 31 is made so heavy that anchoring to the walls is not necessary. If desired, anchors may be arranged between the roof 31 and the walls.

Claims

1. A method of erecting a building (1), in which panels (6) are formed by pouring a filling substance (8) in chute spaces (3) against standing networks (5), characterized in that the panels (6) are formed by filling with a filling substance chute spaces (3) formed by structural elements (2) consisting of frameworks (10) and networks (5) carried by said frameworks (10).

2. A method as claimed in Claim 1 characterized in that rubble is used as a filling substance (8).

3. A method as claimed in Claim 2 characterized in that as a filling substance (8) rubble is used, which is broken up to lumps of the size equal to the order of magnitude of the mesh of the network (5).

4. A method as claimed in Claim 1, 2 or 3 characterized in that as a filling substance alternating layers of rubble and binder such as mortar are arranged in the chute space.

5. A method as claimed in anyone of the preceding Claims characterized in that on the outer side of the chute space (3) a plaster layer is applied to the panel (6).

6. A method as claimed in anyone of the preceding Claims characterized in that a chute space (3) is formed between two structural elements (2) intercoupled by means of coupling elements (9, 20).

7. A method as claimed in Claim 6 characterized in that hooks (22) operating as tensile members are arranged between the opposite networks (5) of a chute space (3).

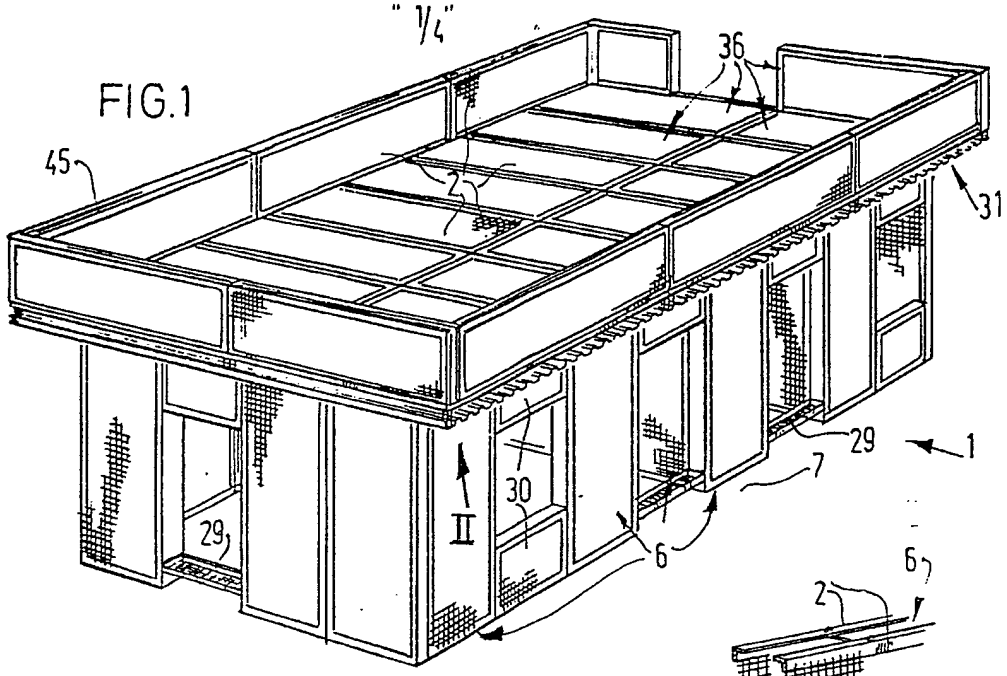
8. A method as claimed in anyone of the preceding Claims characterized in that the neighbouring structural elements (2) are interconnected by means of tie elements (23).

9. A method as claimed in Claim 8 characterized in that for completing a cage construction structural elements (29) used as thresholds are connected by means of tie elements (23) with adjacent structural elements (2).

10. A building constructed by carrying out the method claimed in anyone of the preceding Claims.

11. A structural element apparently intended for use in the method claimed in anyone of Claims 1 to 9 characterized by a framework and a network carried by said framework.

FIG.1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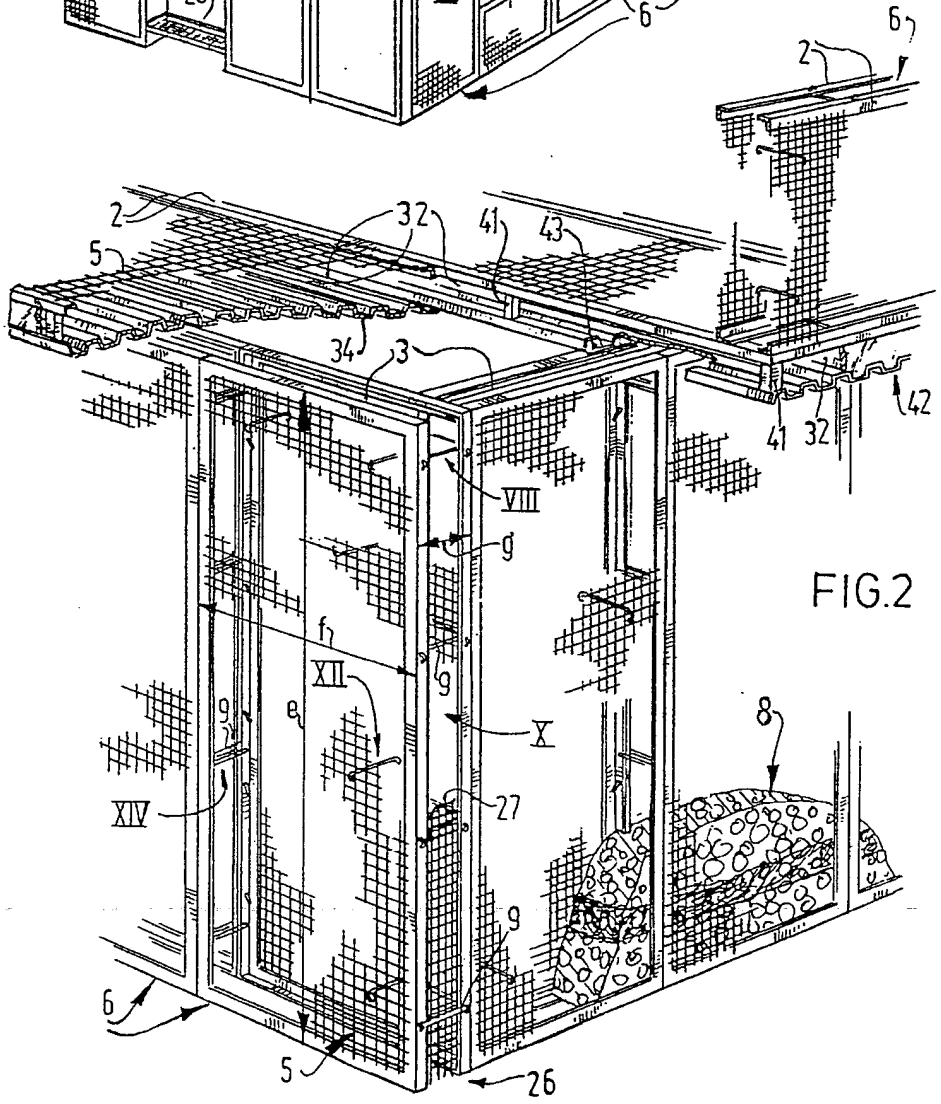
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FIG.2

FIG. 3

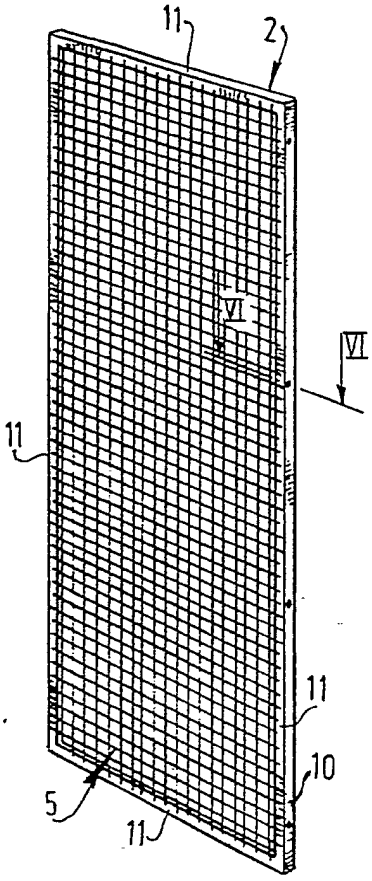



FIG. 4

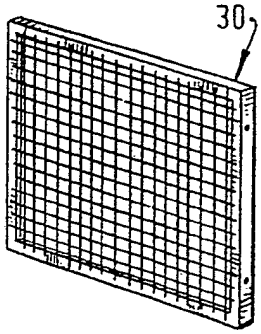



FIG. 16

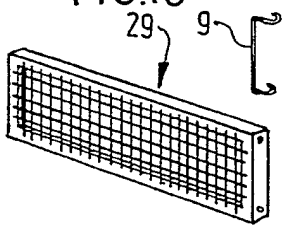



FIG. 5

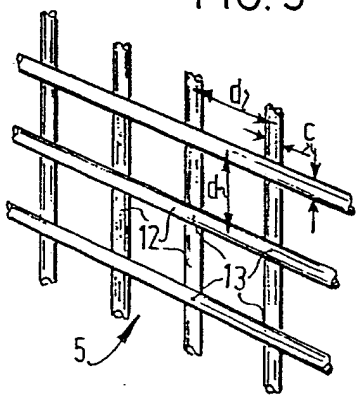
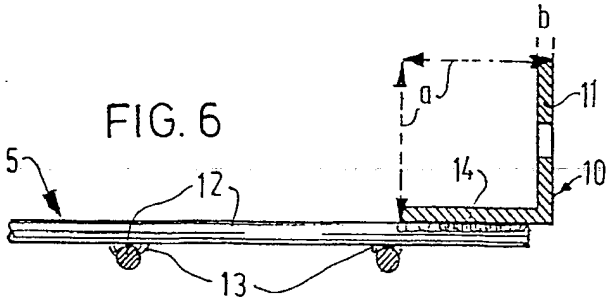



FIG. 6



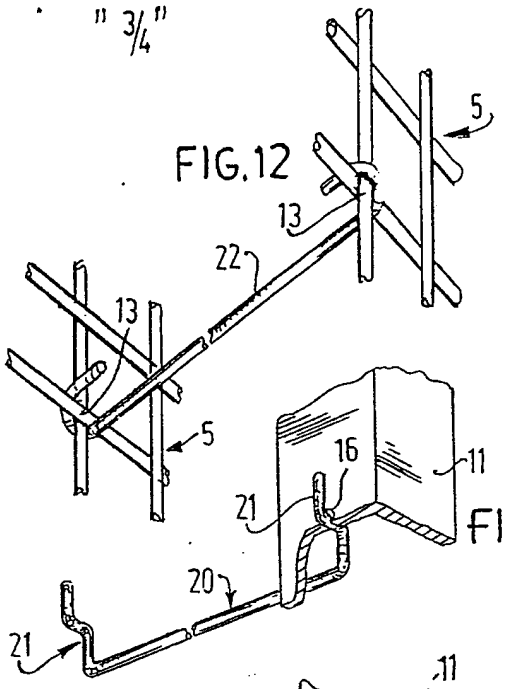



FIG.12

FIG.9

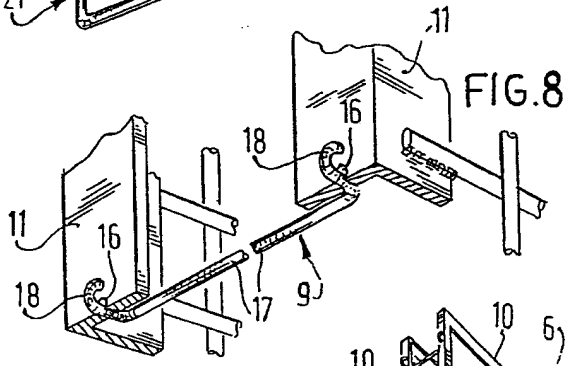



FIG.8

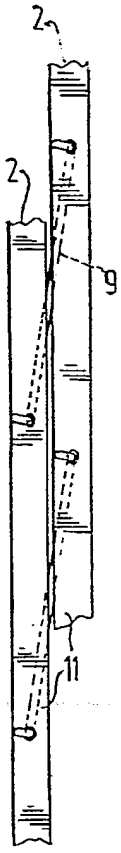



FIG.11

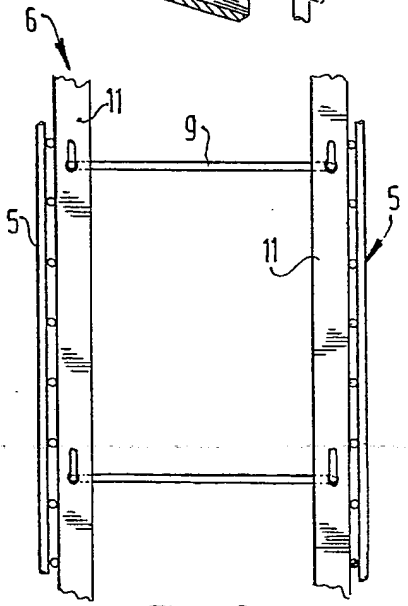



FIG.10

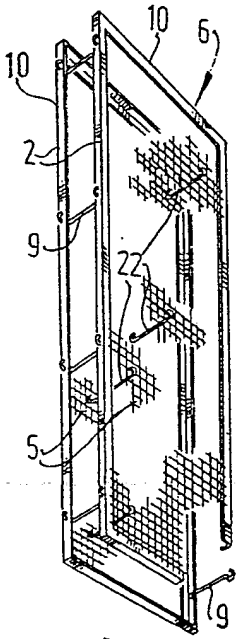
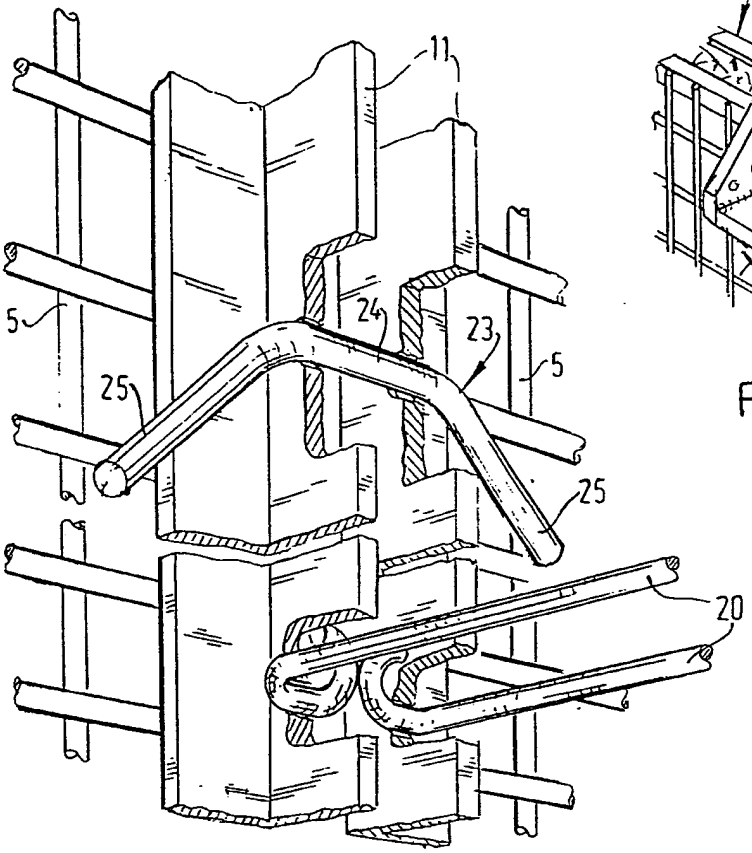



FIG.7

FIG.13



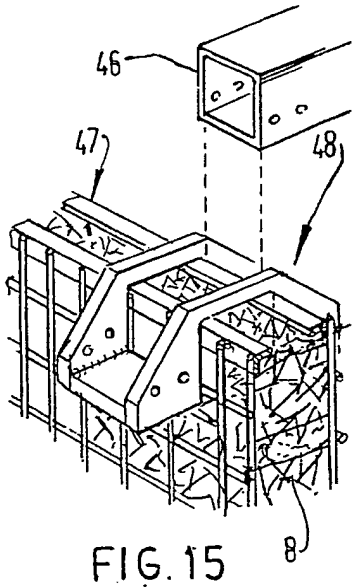




FIG.15

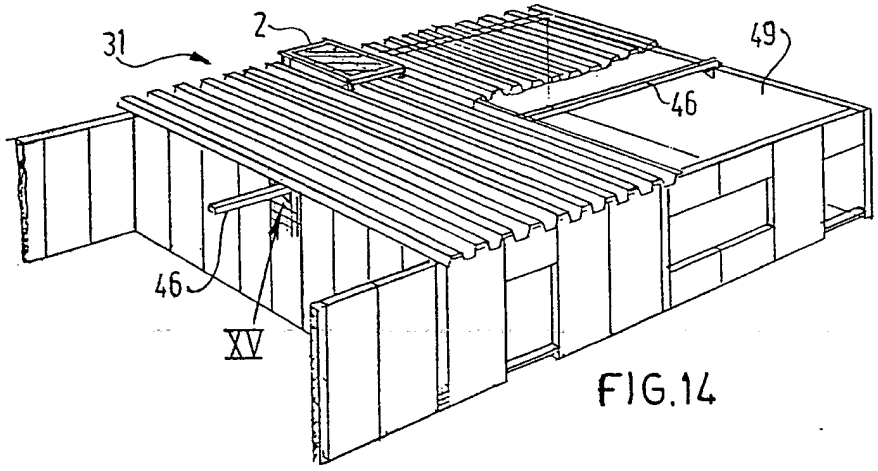



FIG.14

0055504

European Patent Office

Application number
EP 81 20 1399

# EUROPEAN SEARCH REPORT

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim |
|---|---|---|
| Y | US - A - 3 363 371 (VILLALOBOS)<br>* Column 1, lines 38-44; column 4, lines 49-59; column 5, lines 22-48; column 6, lines 38-45; figures 1,15,17 * | 1,8,10, 11 |
| Y | US - A - 3 638 382 (MERILL)<br>* Column 1, lines 28-38; column 2, lines 3-8, 32-55; column 3, lines 16-27; figures 1,2 * | 1,5,6, 10,11 |
| A | GB - A - 280 074 (OGG)<br>* Page 1, lines 8-24,54-78; figures 1,2 * | 1,2,5 |
| A | US - A - 1 982 104 (HOLDSWORTH)<br>* Page 1, lines 1-10, 41-96; page 2, lines 70-79; figures 8,9 * | 1,5,6, 7 |

CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)

E 04 B 1/16
2/86

TECHNICAL FIELDS SEARCHED (Int.Cl. ³)

E 04 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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A: technological background
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E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 02-04-1982 | CAVALERI |